

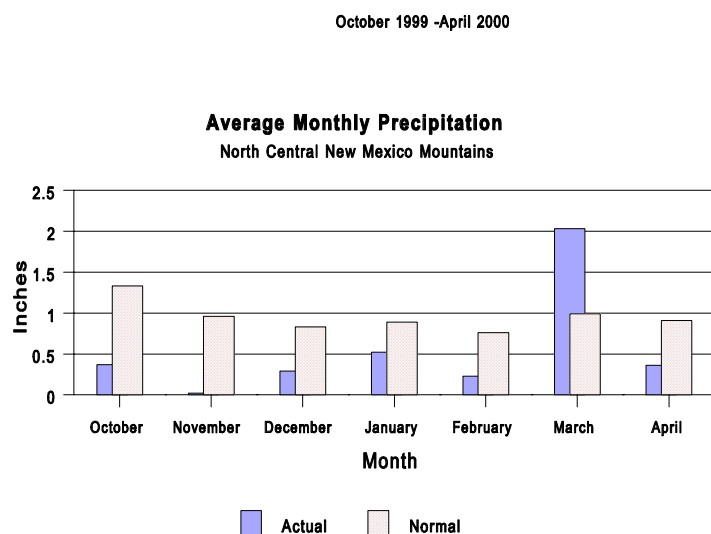
Summary of Weather Information on Cerro Grande Prescribed Fire

I Climatology

Bandelier National Monument is located in the Jemez Mountains of north-central New Mexico. The climate is a temperate mountain type, with about 16" annual precipitation at the Monument. Over half of the total annual precipitation falls in the four months from June through October. Maximum temperatures average near 70 for early May, with minimums in the low 30s.

A good wind climatology was not available for Bandelier, but was available for nearby Los Alamos. There, winds are fairly light much of the year, but climatologically mid-March through June is apt to be windy. During this period, sustained wind speeds exceeding 8.8 mph (4 mps) occur about 20% of the time.

Northern New Mexico, as well as much of the Southwestern U.S., has been in a drought during the early months of year 2000. The Palmer Drought Index for early May shows northern New Mexico to be in a moderate drought (Palmer Index between -2.0 and -2.9). Several stations near Bandelier had below normal precipitation for every month from October 1999 through April 2000, except for a significant wet spell in late March. (See Figure 1). Winter snowpack was well below normal, with a local ski area not opening at all during the entire season.



II Observed weather during the Cerro Grande Prescribed Fire

A light amount (.22") of precipitation was received at the prescribed fire site on April 29-May 1. Otherwise April had been warmer and drier than normal, under persistent high pressure aloft. The high pressure ridge intensified during the first four days of May, reaching its greatest strength on Thursday May 4th, then holding similarly strong through Saturday May 7th. The weather on the day of the prescribed fire was warm and dry under sunny skies. Maximum and minimum temperatures were 72 and 48 at a portable weather station onsite site at 9170' elevation. The weather for the evening of May 4th when the prescribed fire was ignited, came from weather monitors using belt weather kits. At the time of test fire/ignition readings were in the 50s on the upper elevations of the site, with relative humidity (RH) in a 25-30% range. Evening winds were NW 8-12 mph at the ridgetop, with lighter downslope winds on the slopes, mainly 1-5 mph. An eye-level gust of 11 mph at 9300' on a ridgetop was the strongest reported wind.

Friday May 5th saw mostly sunny skies through midday, with some clouds later. Minimum RH ranged from 14-18%, with warm temps and winds West to SW increasing to 15-

18 mph in the afternoon, gusts 20-22 mph on ridgetops. Remote Automatic Weather Stations (RAWS) in the area showed peak 20' wind gusts of 22-34 mph Friday afternoon. Saturday was similar to Friday both wind and humidity-wise, but was cloudier and a little cooler than Friday. Afternoon eye-level winds were mainly SW to West 1-5 mph, with gusts 8-11 mph.

Sunday May 7th had similar temps to Saturday, with further cooling Monday. Minimum relative humidities remained low on Sunday, rising into the 20-30% range under variably cloudy skies. There were no belt weather observations available to the Type 1 Incident Management Team for Sunday May 7th. Area RAWS stations reported SW winds increasing to 10-15 mph (10-minute average) with gusts 28-40 mph. On Monday, winds were again fairly strong and gusty. Some RAWS stations showed a shift in winds from SSW to West or NW about mid-afternoon. The table below shows strongest gusts at nearby Los Alamos National Laboratory for May 4th through May 8th.

Maximum Reported Wind Gusts Los Alamos National Laboratory May 4-8, 2000					
	May 4	May 5	May 6	May 7	May 8
Wind (mph)	NE 30	W 37	W 30	WSW 35	SW 40
Time	2:12 p.m.	10:25 p.m.	1:15 a.m.	1:57 p.m.	2:37 p.m.
Note: Winds measured at Los Alamos station TA-6, 36 feet above the ground.					

III Recent Study from Los Alamos National Labs regarding large wildland fires

LANL meteorologist Jeff Baars (personal communications, Los Alamos National Laboratory, May 16, 2000) did a recent study that examined the joint probability of occurrence of strong winds and High to Very High fire danger. He used April through June data covering 1980-1998. Fire danger was determined using Bandelier NM Energy Release Component (ERC). Average afternoon wind speeds of greater than 10 mph (averaged over 15 minutes) were used to represent strong winds. On those days peak wind gusts were commonly 30-40 mph. Wind directions examined were confined to a South to West-NW range.

The study results show that this combination of fire danger, wind direction, and wind speed occurred over a three-day period about once every four years. When such three-day periods occur, it is likely that there will be more than one within that year. The analysis concluded that a major fire moving up to the edge of the laboratory is not only credible but likely, with a return frequency of about 0.1, that is averaging one occurrence per ten years.

IV Forecasts

Bandelier NM lies within the County Warning Area of the Albuquerque National Weather Service (NWS) office. The Meteorologist in Charge is Charlie Liles. The primary Fire Weather contact for land management agencies is Chuck Maxwell, who works the bulk of Fire Weather shifts during the April to October fire season. Several others in the office have some fire weather experience, and all forecasters have completed all or part of the correspondence Intermediate Fire Behavior course. The office staff feels they work together well, discussing and coordinating forecasts as needed between the various forecast desks such as Public, Aviation, Severe Weather, and Fire Weather.

Preparedness forecasts are routinely issued twice daily at 9:30 a.m. and 2:30 pm. Land managers typically request site-specific (spot) forecasts via fax, and occasionally via telephone. Completed spot forecasts are returned to the requestor via fax, usually within 30-60 minutes. This was the case for all Cerro Grande Prescribed Fire spot forecasts, which generally verified well with observed weather. Copies of pertinent preparedness and spot forecasts as well as onsite weather observations are attached at the end of this narrative.

The Type 1 Incident Management Team did, however, note two areas of concern: 1) The majority of preparedness forecasts lacked any wind forecast in the 3-5 Day extended period. On Friday May 5th, there was no forecast regarding winds for the Sunday through Tuesday outlook period. 2) There were also some concerns in how Fire Weather Watch and Red Flag Headers were used (See Section 6).

V Haines Index Analysis

Haines Index May 1- 8, 2000		
Date	Morning	Afternoon
May 1	3	2
May 2	3	4
May 3	6	6
May 4	5	6
May 5	5	6
May 6	5	6
May 7	3	6
May 8	3	5

Land management agencies and fire weather forecasters have used the Haines Index operationally since the early 1990s as an indicator for the potential of extreme fire behavior (e.g., high rates of spread, extensive spotting, and running crown fires) associated with plume dominated fires. The Haines Index combines two atmospheric parameters- stability and dryness - that can potentially effect the growth of wildland fires. The index varies between 2 and 6. A Haines Index of 2 indicates moist, stable air with very low potential for large fire growth while a

6 indicates dry, unstable air with an increasing potential for plume dominated fires. However, other factors such as slope, fuel moisture, fuel loadings, and wind also play a crucial role in the development of plume dominated wildfires and large fire growth.

Climatologically, a Haines Index of 5 or 6 is not uncommon in northern New Mexico during May. It occurs about 22% of the days during the morning hours and 54% of the days during the late afternoon and evening hours. The table above shows calculated values of the Haines Index taken from the Albuquerque, New Mexico upper air sounding from May 1, 2000 through May 8, 2000. The index was a 5 or 6 from May 3rd to May 6th and also on the afternoons of May 7th and May 8th, which indicated a moderate to high potential for a plume dominated fire or large wildfire growth. However, information gathered by the Cerro Grande Type 1 Incident Management Team failed to show any evidence of extreme fire behavior or large fire growth on May 4th, 5th and 6th. Further evidence shows that the large fire growth that occurred on Sunday, May 7th was due to very strong, gusty winds that fanned the Cerro Grande Prescribe Fire into a wind-driven, crown fire.

VI Review of Red Flag warnings

The fire weather Red Flag program is used to alert the user agencies of weather conditions in combination with critically dry or volatile fuel conditions either occurring or expected to occur that could lead to the rapid development and/or increase in wildfire activity..

Three phases are used: 1) Fire Weather Watch (FWW), 2) Red Flag Warning (RFW), and 3) Cancellation. A Fire Weather Watch will be issued when the fire weather forecaster is reasonably confident a Red Flag event will occur within the next 24 to 72 hours. A Red Flag Warning is issued to warn land management agencies of an impending or already occurring Red Flag event. Red Flag warnings will remain in effect until the critical weather pattern ceases or the conditions fail to develop as forecast.

Several FWW's and RFW's were issued by Albuquerque NWS during the course of the Cerro Grande Prescribed Fire. The Type 1 Incident Management Team noted several instances where a FWW or RFW headlined a forecast zone, but had no reference to location, weather event, or valid time period. The Type 1 Incident Management Team also noted several instances when RFW's were cancelled overnight, but immediately reissued with the following day's Morning preparedness forecast. When the event seems to be diurnal in nature, but the large-scale governing weather pattern hasn't changed, it would be prudent and less confusing to the fire community to continue the RFW until the weather pattern changes.